



Impact by Dead Channels in CMS HCAL on the Missing E_t Measurement

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Introduction

The front end electronics will be located in the “decoder box” that is installed at the large eta large, large z corner of the HB, and in a similar position in HE. The access to the electronics inside the box will be extremely limited due to the cabling/piping of services for other CMS detectors. Thus accesses to the inside of the decoder box will occur infrequently (order once per two - five years). This implies that electronics channel failures will not be repaired immediately. The purpose of this study is what the effect of dead channels will have on missing E_t performance.

The Model

Using our parameterized simulation program[1], we have created the LEGO for the HAC1, HAC2, the HO, and the ECAL separately. We are using the QCD process with P_t of jets greater than 2.5 TeV, as a physics source to estimate the E_t missing. (ISAJET cards in appendix 1).

We concentrated on the HAC1 and HAC2 and looked at the following cases: 0 %; 5%, or 10% random dead channels in HAC1 and HAC2. For each channel, a random number between 0 and 1 was chosen. If the number was < 0.05 (or 0.1% for the 10% case), the energy in that channel of the lego was zeroed. Then the total missing E_t was recalculated and compared to the case with no dead channels. (See figure 1). For the case of 5%, as shown in figure 1, we see little difference. We found that the maximum damage at E_t missing around 500 GeV is about factor of 2 for the case of 10 % dead channel, which is still acceptable for most of physics study, such as SUSY search.[2]

Conclusions

The missing E_t distribution is insensitive to dead channels to the level of about 5%. This level of allowed failure rate is something we should be able to achieve. It will be interesting to extend this study to other physics processes, for example reconstruction of $W \rightarrow 2$ jets.

References

- [1] A.Beretvas et al, "SSCSIM: Development and Use by the Fermilab SDC group", in Proc. of MC93, The international Conference on Monte Carlo Simulations in High Energy Physics and Nuclear Physics, Tallahassee, Florida, Feb.1993
- [2] Missing Et + jet Signals for Super-symmetry in the CMS Detector at the LHC
FERMILAB-FN-642 CMS-TN/96-058 I.Gaines et al. June 1996

Appendix 1

ISAJET JOB CARDS

14000,1,1,0/
TWOJET
BEAMS
'P','P'/
PT
2500.,3500.,2500.,3500./
TMASS
175/
JETTYPE1
'UP','DN','GL','UB','DB','ST','SB','CH','CB','BT','BB'/
JETTYPE2
'UP','DN','GL','UB','DB','ST','SB','CH','CB','BT','BB'/
SEED
94665/
NTRIES
20000/
END
STOP

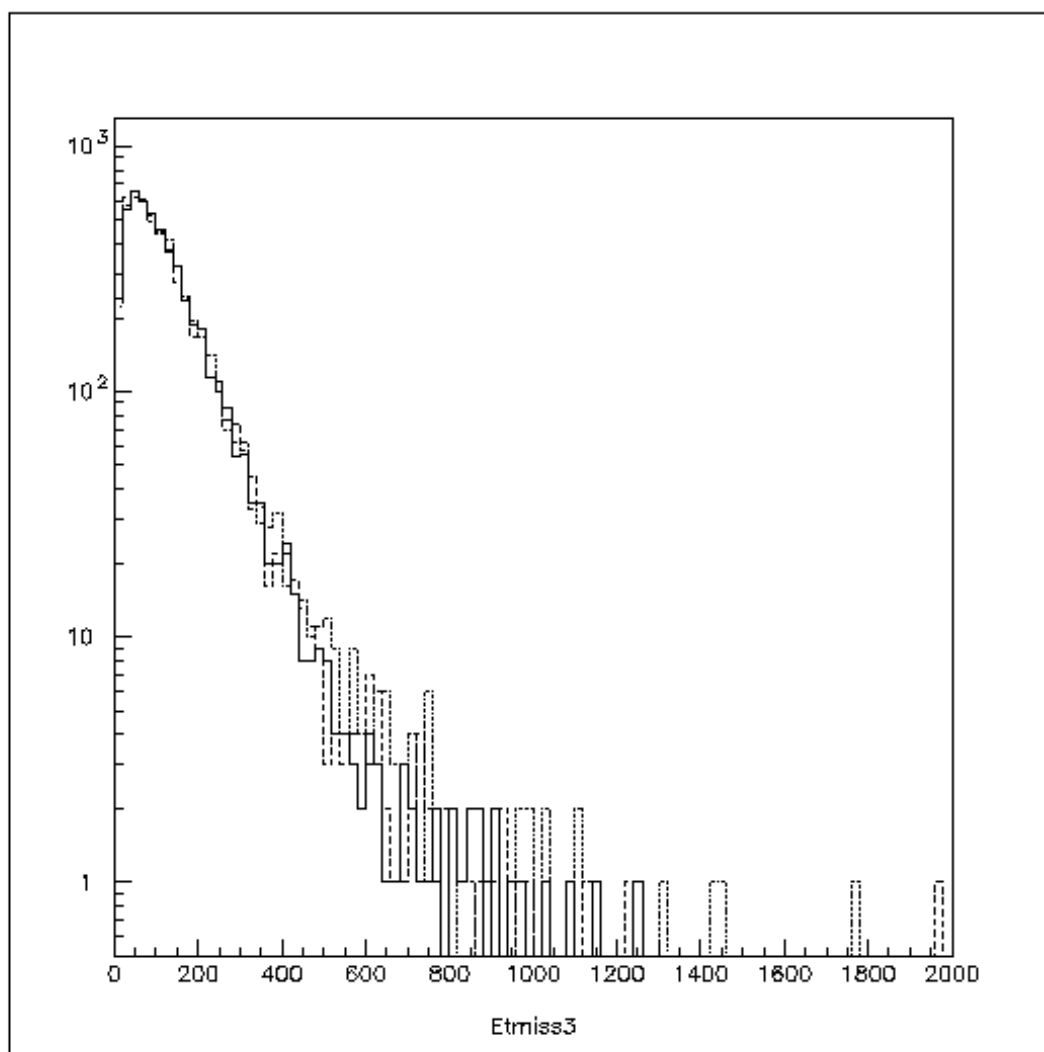


Figure 1. Missing E_t distribution for 0% dead channels (solid); 5% dead channels (small dashes); and 10% dead channels (large dashes).